SCIENCE AND TECHNOLOGY ASSOCIATES
TECHNICAL SUPPORT
TO
DARPA IPTO/TTO
EMBEDDED HIGH PERFORMANCE COMPUTING

CONTRACTOR'S
FINAL REPORT

Reporting Period
2/27/98 through 12/31/04

Under Prime Contract No: NBCHC010034

Requisition/Purchase Request and Commitment Number (PR&C)
HJ1500-8014-0266

AAP Number: DAR8F842/00 (ARPA Order # F842/00)

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
04 MAR 2005	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Embedded High Performance Computing	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Science and Technology Associates, Inc. 4100 Fairfax Dr., Suite 910, Arlington, VA 22203**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**6**	

TECHNICAL SUPPORT TO DARPA IPTO
EMBEDDED HIGH PERFORMANCE COMPUTING

Contract No: Prime NBCHC010034
Contractor: Science and Technology Associates, Inc.
4100 Fairfax Dr., Suite 910, Arlington, VA 22203
Contract Period of Performance: 2/27/98 through 12/31/04

Total Funds Received: Total funding to date: $9,654,142;
negotiated total contract value $9,692,148.

DARPA Program managers:
Mr. Robert Graybill (IPTO) and Dr. Robert Reuss (MTO/TTO)
Principal Investigator/Telephone No.: Mr. Jon Hiller/(703) 522-5123
Reporting Period: 2/27/98 through 12/31/04

I. INTRODUCTION/TASKS

The Embedded Computing activities supported under this contract have been in support of multiple DARPA programs and efforts in support of the development and application of embedded computing. These activities have included: the Embeddable High Performance Computing (EHPC) Program, the Adaptive Computing Systems (ACS) Program, the Just In Time Hardware (JITH) efforts, the Data Intensive Systems (DIS) Program, the Mobile Autonomous Robotic Systems (MARS) Program, the Software for Distributed Robots (SDR) Program, the Quorum Program, the Next Generation Internet (NGI) Program/Advanced High Speed Communications, the Power Aware Computing and Communications (PAC/C) Program, the Model-Based Integration of Embedded Software (MoBIES) Program, the Software Enabled Control (SEC) Program, the Digital Radio Frequency Tags (DRaFT) Program, the Polymorphous Computing Architectures (PCA) Program, the Mission Specific Processing (MSP) Program, the High Productivity Computing Systems (HPCS) Program, the Clockless Logic Analysis, Systems, and Synthesis (CLASS) Program, the Architectures for Cognitive Information Processing (ACIP) Program, Graphics Processing Unit (GPU) for Computer Generated Forces (CGF) Program, and Joint Battle Command activities; developing activities including study (initial potential program investigation activities) efforts – such as the electronic Textiles (e-Textiles) effort; the assessment and development of new program concepts; and the investigation of new embedded processing, computing architectures, communications, system development support, and software technologies. This set of programs and related technical activities address novel and advanced processing technologies that enable new and expanded performance and operational capabilities for high value embedded and high performance computing applications. STA supported the technical development and application of embedded and high performance-computing efforts through the technical support of the above programs and activities under this contractual effort.

The pursuit of embeddable high performance computing, polymorphous computing architectures, mission specific processing capabilities, adaptive computing, data intensive memory developments, high productivity computing systems, advanced communications, integrated software domains, integrated development environments, and cognitive approaches will enable embedded and high performance military applications previously unachievable due to computing and processing environment limitations. The objective of the Science and Technology Associates, Inc. (STA's) activity was to provide technical support, review, and analysis of high performance, adaptive embedded computing, communications, integrated development environments, and autonomous capabilities for a wide variety of applications through the technical support of the DARPA programs and technical activities supported.

STA performed independent technical analyses for the DARPA programs supported, proposed new start program and new development activities, study activities, and technologies at the direction DARPA program managers. STA investigated specific technology areas and evaluated specific component technologies relevant to the DARPA programs and technical activities supported. This included selected computing activities, systems, subsystems, and supporting technologies as appropriate. This specifically included aiding the DARPA program managers in the development of new program activities. STA provided technical support for the development of new technology concepts, new program concepts, and the evaluation of supporting processing and computing technologies, within the scope of this contract and per the direction of DARPA. STA supported program reviews, meetings, and the preparation of related program materials. STA aided in the development of representative technical briefings and presentational materials for the programs and activities supported. STA aided in the coordination, organization, and planning of DARPA program and related technical meetings, reviews, and principal investigators meetings. STA promoted the utilization of the DARPA activities supported for military and other applications. STA supported activities to enable the development and evaluation of relevant technology application and insertion into high value military applications.

II. TECHNICAL ACCOMPLISHMENTS

During the performance of this contract, STA (including STA consultants) provided technical support for a set of DARPA programs and technical activities that worked to advance the development of embedded and high performance processing architectures, communications, software, support environments, and applications. As noted above, over the course of the contract the following specific DARPA activities were supported: the Embeddable High Performance Computing (EHPC) Program, the Adaptive Computing Systems (ACS) Program, the Just In Time Hardware (JITH) efforts, the Data Intensive Systems (DIS) Program, the Mobile Autonomous Robotic Systems (MARS) Program, the Software for Distributed Robots (SDR) Program, the Quorum Program, the Next Generation Internet (NGI) Program/Advanced High Speed Communications, the Power Aware Computing and Communications (PAC/C) Program, the Model-Based Integration of Embedded Software (MoBIES) Program, the Software Enabled Control (SEC) Program, the Digital Radio Frequency Tags (DRaFT) Program, the Polymorphous

Computing Architectures (PCA) Program, the Mission Specific Processing (MSP) Program, the High Productivity Computing Systems (HPCS) Program, the Clockless Logic Analysis, Systems, and Synthesis (CLASS) Program, the Architectures for Cognitive Information Processing (ACIP) Program, GPU for CGF Program, and Joint Battle Command activities; and DARPA IPTO (Information Processing Technology Office) (and previously Information Technology Office (ITO)), TTO (Tactical Technology Office), MTO (Microelectronics Technology Office), IXO (Information Exploitation Office), and ATO (Advanced Technology Office) technical activities. STA's activities supported under this contract included technical review, analysis, and support of the DARPA programs and activities supported; investigation of potential applications of technologies developed; support for the development of new program concepts and related activities; investigation of selected technical areas and activities; and general technical support under the direction of Mr. Robert Graybill, Dr. Douglas Gage, Dr. Robert Reuss, Dr. John Bay, Dr. Tim Grayson and IPTO, MTO, IXO, and TTO.

Specific programs supported and the DARPA program managers and offices that STA supported and took direction from include:

EHPC Program: The EHPC Program was under the direction and supervision of successively Dr. José Muñoz (DARPA TTO/ITO) and then Colonel Mark Swinson (DARPA ITO). The EHPC Program is complete.

ACS Program: The ACS program was initiated by Robert Parker (CSTO) and then successively under the direction and supervision of Dr. José Muñoz (DARPA TTO/ITO), Dr. Tom Green and Dr. Allan Steinhardt (DARPA TTO), Dr. William Phillips (DARPA TTO), Dr. Allan Steinhardt (DARPA TTO), and finally Dr. Robert Reuss (DARPA MTO/TTO). The ACC Program is complete.

DIS Program: The DIS Program was under the supervision and direction successively of Dr. José Muñoz (DARPA ITO/TTO) and then Mr. Robert Graybill (DARPA ITO/IPTO). The DIS Program is complete.

MARS Program: The MARS Program was initiated under the supervision and direction of Colonel Mark Swinson (DARPA ITO) and then under the supervision and direction of successively Colonel Mark Swinson and then Dr. Douglass Gage (DARPA ITO/IPTO). The MARS Program is complete.

SDR Program: The SDR Program was initiated under the supervision and direction of Colonel Mark Swinson (DARPA ITO) and then under the supervision and direction of successively Colonel Mark Swinson and then Dr. Douglas Gage (DARPA ITO/IPTO). The SDR Program is complete.

PAC/C Program: The PAC/C Program was originally proposed and approved under Dr. José Muñoz (DARPA TTO/ITO). The program was restructured and initiated under the supervision and direction of Mr. Robert Graybill (DARPA IPTO/ITO). Mr. Graybill has been the only program manager for the PAC/C program. The PAC/C program is in the final demonstration and transition phase.

JITH efforts: The Just In Time Hardware (JITH) efforts were elements of the ACS program that were retained in DARPA ITO as the ACS program was transitioned from DARPA ITO to TTO. These efforts were under the supervision and direction initially of Dr. José Muñoz (DARPA ITO/TTO) and then Mr. Robert Graybill (DARPA ITO/IPTO). JITH activities are completed.

Quorum Program: The Quorum Program was under the supervision and direction of Dr. Gary Koob (DARPA ITO/IPTO). Quorum Program activities are completed.

NGI/Advanced Communications: The NGI/advanced communication efforts were under the supervision and direction of Dr. Mari Maeda (DARPA ITO). The NGI Program is completed.

DRaFT Program: The DRaFT program was under the supervision and direction of Dr. Tim Grayson (DARPA TTO). The DRaFT Program is completed.

MSP Program: The MSP Program was initiated under Dr. José Muñoz (DARPA TTO/ITO) and Dr. Allan Steinhardt (DARPA TTO). The MSP program was then successively under the supervision and direction of Dr. Allan Steinhardt (DARPA TTO), Dr. William Phillips (DARPA TTO), Dr. Allan Steinhardt (DARPA TTO), and currently Dr. Robert Reuss (DARPA MTO/TTO). The MSP program is ongoing.

PCA Program: The PCA Program was initiated under the supervision and direction of Mr. Robert Graybill (DARPA ITO/IPTO). The PCA Program has been under and is currently under the supervision and direction of Mr. Robert Graybill (DARPA ITO). The PCA program is ongoing.

E-Textiles efforts: The e-Textiles study activities were initiated under Mr. Robert Graybill (DARPA ITO/IPTO) and Dr. Elaine Ethridge (DARPA MTO). E-Textile activities and study efforts were under the supervision and direction of Mr. Robert Graybill (DARPA ITO/IPTO) and Dr. Ethridge (DARPA MTO). The e-Textile activity was never approved as a full program.

HPCS Program: The HPCS Program was initiated under Mr. Robert Graybill (DARPA ITO/IPTO). The HPCS Program has been under and is currently under the supervision and direction of Mr. Robert Graybill (DARPA ITO/IPTO). The HPCS Program is ongoing.

CLASS Program: The CLASS Program was initiated under Dr. Robert Reuss (DARPA MTO/TTO). The CLASS Program has been under and is currently under the supervision and direction of Dr. Robert Reuss (DARPA MTO/TTO). The CLASS Program is ongoing.

SEC and MoBIES Programs: The SEC and MoBIES programs were under the supervision and direction of Dr. John Bay (DARPA IXO). The SEC and MoBIES Programs are in their final phases.

ACIP Program: The ACIP Program was recently initiated under Mr. Robert Graybill (DARPA IPTO). The ACIP Program is under the supervision and direction of Mr. Robert Graybill (DARPA IPTO). The ACIP Program is ongoing.

GPU for CGF Program: The GPU for CGF Program was recently initiated under Mr. Robert Graybill (DARPA IPTO). The GPU for CGF program is under the supervision and direction of Mr. Robert Graybill (DARPA IPTO). The GPU for CGF Program is ongoing.

Joint Battle Command Activities: The Joint Battle Command activities are under the supervision and direction of Dr. John Allen (DARPA ATO). Battle Command Activities are ongoing.

STA aided in the technical activities to develop and initiate the MARS, SDR, PAC/C, PCA, MSP, PCA, HPCS, CLASS, DRaFT, and ACIP Programs.

STA provided technical support and review of programs, study activities, and associated technical and program activities, technologies, and concept developments. STA continued to work under the direction of the DARPA program managers and with the programs' agents and contractors to technically monitor and review ongoing programs, aid in the coordination and arranging of technical program reviews, investigate and prepare technical information and material, prepare and monitor program review action items, and support the development and pursuit of new concepts, technologies, and associated program new start activities. Detailed and specific technical and programmatic activities performed in support of this effort and the programs and activities listed above were reported via the 27 Quarterly reports and the 82 monthly reports submitted to Fort Huachuca contracting and to DARPA.

General:

STA and STA consultants provided technical support to DARPA, this included the gathering, review, analysis, and creation of technical materials and information for supported DARPA programs, the development of new program concepts, and other activities at the direction of DARPA. STA met for direction on a regular basis with DARPA program managers for direction and to report status of STA support activities. STA worked directly with DARPA financial and programmatic personnel to support technical areas/documentation; meeting planning, development, and coordination; and financial coordination and activities related to the programs and technical activities supported.

STA attended ITO/ITPO ADPM meetings and other office meetings as required and requested. STA provided support as required and requested to the DARPA offices supported under the activities listed above and under the supervision of DARPA.

III. PROBLEM AREAS

None.

IV. FUTURE EFFORTS

None under this contract. This contract has been terminated.

V. ACTIONS REQUIRED BY THE COTR

None.